

Applicants are grateful for the personal interview granted by the Examiner on October 9, 2001.

OBJECTION TO THE SPECIFICATION

The disclosure was objected to for incorrectly describing at page 11, line 17 through page 12, "the wrist 11a" instead of "the wrist 1a." In view of the this amendment, the specification at page 11, line 17 now properly discloses "the wrist 1a." Accordingly, withdrawal of this objection is respectfully requested.

REJECTION UNDER 35 USC §102

Rejection of claims 1-2

Claims 1-2 were rejected under 35 USC §102(b) as being anticipated by Bannister (EP 0265661). This rejection is traversed for the following reasons stated below.

As discussed during the personal interview of October 9, 2001, and agreed to by the Applicant's personal representative and the Examiner, although Bannister (Figure 2) may be interpreted (as pointed out by the Examiner during the personal interview) as having a moveable arm with an axis 23, it does not teach or suggest "a tool unit mounted on said wrist at a distal end of said movable arm, and having an effecting end biased with respect to a final rotational axis of said wrist and directed to said final rotational axis," as recited in independent claim 1, as amended and proposed to the Examiner during the personal interview.

For example, if member 13 is interpreted (as stated by the Examiner) as being a tool unit mounted on a wrist 27 of a movable arm, the effecting end 14 is not "directed to a final rotational axis of said wrist," which would have to be axis 29, as suggested by the Examiner during the personal interview, but instead is directed away from the final rotational axis of member 27.

For at least the above reasons, it is respectfully submitted that since Bannister does not disclose each of the features as recited in independent claim 1, this claim is allowable over Bannister. Accordingly, withdrawal of this rejection and allowance of independent claim 1 are earnestly solicited.

Rejection of claims 3-8

Claims 3-8 were rejected as being anticipated by Roder (US 4,694,139). This rejection is respectfully traversed for the following reasons stated below.

Although Roder discloses in figure 2, as pointed out in the Office Action, a guidance device for a laser beam in machining workpieces, this system is limited to one in which a telescopic member 3 is extended by several telescopic pieces (i.e., 16) that are movable around their respective telescopic joints (i.e., rotational areas 4, 5 and 7). More specifically, this telescopic installation unit 3, when working on a workpiece, is required to move several of its joints/axis, or rotate at least one telescopic piece within another in order to perform the desired work on a workpiece. As a result, depending on the desired job to be performed, several of the connected telescopic pieces must move and rotate, including the end piece 15, which is part of the installation unit 3, rather than a separate tooling unit that can rotate independent of other movable extensions, as taught in Applicants' invention. Accordingly, since the telescoping installation of Roder is one continuous movable unit, this system does not teach or suggest such features as a wrist, or a final rotational axis in which a tool unit can be mounted on and rotated independently with respect to a movable arm, in addition to features such as the specific positioning of an effecting end of a tool unit with respect to either a final rotational axis of either a moveable arm or a wrist.

Therefore, Applicants respectfully submit that Roder does not teach or suggest "a movable arm" together with "a tooling unit mounted on a distal end of said movable arm and having an effecting end and a variable axis varying a position or a direction of said effecting end with respect to a final rotational axis of said movable arm," as recited in independent claim 3 of Applicants' invention. Further, Roder does not teach or suggest "a movable arm" together with "a tooling unit mounted on a distal end of said movable arm, and having an additional rotational axis biased with respect to a final rotational axis of said movable arm and an effecting end biased with respect to said additional rotation axis and directed to said additional rotation axis," as recited in independent claim 8 of Applicants' invention.

The novel features recited in independent claims 3 and 8 provide some of the following benefits not obtainable from conventional systems, including Roder. For example, by providing a tool unit that can be biased with respect to a movable arm of a robot system, the movable arm, once placed at a location of a workpiece, can be stably positioned such that it is no longer required to be moved. Thus, vibrations due to movement of a robot moveable arm are not created, while the tool unit itself can be rotated about the workpiece to perform the work thereon. In this manner, a precise cut can be obtained in the workpiece by movement of the tool unit itself, since no moving arms or moving telescopic pieces are required to perform the work on the workpiece.

In addition to the above benefits provided by Applicants' invention, another benefit includes, for example, the central axis of a workpiece (such as a pipe) can be aligned with the final rotational axis of the movable arm. Thus, the tool unit mounted on the distal end of the movable arm can be rotated 360 degrees around the workpiece without any required movement from the moveable arm (or any moveable telescopic members), thus avoiding any inaccurate cuts in the workpiece due to vibrations caused by moving arms or rotating/extending telescopic pieces necessary in conventional systems, such as Roder.

For at least the above reasons, it is respectfully submitted that claims 3-8 are allowable over Roder.

Rejection of claim 9-16

Claims 9-16 were rejected as being anticipated by Roder (US 4,694,139). This rejection is respectfully traversed for the following reasons stated below.

As was stated above, Roder is limited to a system in which a telescopic unit 3 is extended by several telescopic pieces (i.e., 16) that are movable around their respective telescopic joints (i.e., rotational areas 4, 5 and 7). Thus, at least several, if not all of the parts of the telescopic unit must rotate in order to perform work on a workpiece. Accordingly, Roder does not teach or suggest "a movable arm including a plurality of links and a wrist..., a tool unit mounted on said wrist at a distal end of said movable arm, and having an effecting end biased with respect to a final rotational axis of said wrist and directed to said final rotational axis" together with "arranging the workpiece so that a central axis of the workpiece is aligned with the final rotational axis of said wrist," as recited in independent claim 9 of Applicants' invention. Similar arguments apply with respect to independent claims 11 and 16.

For at least the above reasons, it is respectfully submitted that claims 1, 3-9, and 11-16 are patentable over the prior art of record, and allowance of these claims is earnestly solicited.

If there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please AMEND the third partial paragraph at page 11 as follows:

--A tool unit 12 according to the third embodiment is constituted by an attaching portion 12a for attaching the tool unit 12 to the robot wrist 1a, an axis 12b in an L shape extended from the attaching portion 12a in parallel with an attaching face of the robot wrist 1a (perpendicular to the final axis 1 of the movable arm of the robot) and bent perpendicularly at a distal end thereof, an additional rotational axis 12c provided at a distal end of the axis 12b, a first additional variable axis 12d connected to the additional rotational axis 12c for expanding and retracting in a direction in parallel with the attaching face of the robot wrist [11a] 1a, a second variable axis 12e connected to a distal end of the first variable axis 12d for expanding and retracting in a direction perpendicular--.

IN THE CLAIMS:

Please CANCEL claims 2 and 10.

Please AMEND the following claims 1 and 9 as follows:

1. (ONCE AMENDED) A robot system comprising:
a movable arm including a plurality of links and a wrist connected by joints and controlled by a robot controller having a software processing function; and
a tool unit mounted on said wrist at a distal end of said movable arm, and having an effecting end biased with respect to a final rotational axis of said [movable arm] wrist and directed to said final rotational axis.

9. (ONCE AMENDED) A method of machining a cylindrical workpiece with a robot system comprising a movable arm including a plurality of links and a wrist connected by joints and controlled by a robot controller having a software processing function, a tool unit mounted on said wrist at a distal end of said movable arm, and having an effecting end biased with respect to a final rotational axis of said [movable arm] wrist and directed to said final rotational axis, said method comprising the steps of:

- (a) arranging the workpiece so that a central axis of the workpiece is aligned with the final rotational axis of said [movable arm] wrist; and
- (b) rotating said final [rotary] rotational axis to perform machining on the workpiece.